

DMAP Alter for Stiffness Matrix Equilibrium Checks

1. Development of Equations For Stiffness Matrix Equilibrium Check

The basic idea behind the stiffness matrix equilibrium check is to verify whether the model, in an unrestrained state, can undergo simple rigid body motion without generating internal forces. The check is accomplished using DMAP by multiplying the unrestrained stiffness matrix by a set of rigid body displacements. A set of six rigid body displacement vectors is obtained using DMAP module VECPLOT (with option 4). Denote this G-set size of six rigid body displacement vectors as the matrix U_{gr} . If we multiply this by the G-set stiffness matrix (K_{gg}) we should get a matrix (g rows and r=6 columns) of all zeros. However, due to numerical roundoff, all of the terms in this product will rarely ever be exactly zero. Therefore, calling the product P_{gr} , we have:

$$K_{gg} U_{gr} = P_{gr} \quad 1.$$

Since U_{gr} has 6 columns (one for each rigid body displacement vector), P_{gr} has 6 columns also. It is referred to as “All Forces” in the DMAP description below. The terms in P_{gr} should be small. However, due to modeling problems (discussed below) some of the terms in it may not be small. By printing out the forces the analyst can get a feel for whether there are problems in the model. A common practice is to print terms from P_{gr} larger than some small value (say .01). This is somewhat arbitrary since two models identical except for the material stiffness would have different magnitude terms in P_{gr} . Thus, it is appropriate to “scale” the terms in P_{gr} to avoid this problem. As scaling factors, use the diagonal terms from the stiffness matrix. Denoting the diagonal of the stiffness matrix as K_{gg_D} , we calculate:

$$P_{gr_N} = K_{gg_D}^{-1} P_{gr} \quad 2.$$

P_{gr_N} is a normalized measure of the equilibrium check and is referred to as “Normalized Forces” in the DMAP description. All terms in P_{gr_N} should be zero, and will be (except for numerical roundoff), unless there is a problem with the model. These terms may be more meaningful than those in P_{gr} since they are scaled according to the stiffness magnitudes. The terms in P_{gr_N} that are larger than some value (say .00001) are printed out. These are indicators as to the area of the model which could have problems.

For very large models that have significant difficulty passing the equilibrium check, a large amount of terms will get printed out in P_{gr_N} even with a small filter. A smaller 6 x 6 matrix can be calculated that will show very compactly if there are any of the rigid body modes that are exhibiting equilibrium problems. Multiplying equation 1 by the transpose of U_{gr} we get the 6 x 6 matrix

$$S_{rr} = U_{gr}^T K_{gg} U_{gr} \quad 3.$$

The i-th diagonal from S_{rr} is proportional to the strain energy in the i-th rigid body mode and should be zero. In fact, all of the terms in S_{rr} should be zero. S_{rr} is referred to as “Forces Summed” in the DMAP description. If the i-th rigid body mode is exhibiting equilibrium problems, the i-th diagonal term in S_{rr}

will not be zero. Thus S_{rr} can be used as a compact indicator of whether there are any equilibrium problems, and if there are equilibrium problems, it can indicate which rigid body mode is exhibiting the problem. It cannot pinpoint the area of the model in which the problem exists as can matrix P_{gr_N} .

Problems in the G-set stiffness matrix can result from warped quadrilateral elements, elements with bad aspect ratio's and elements with "bad" geometry, in general. Bad geometry means element shapes that are out of the normal range specified for their use.

The above check can be made on other than the G-set stiffness matrix. A check on the N-set stiffness matrix can uncover problems with multi-point constraints that would not show up in the G-set check. A check on the F-set stiffness matrix would expose problems with single point constraints that are not needed to prevent singularities. Similarly, a check can also be made on the A-set matrix which would expose problems resulting from the elimination of DOF's via the Guyan reduction (OMIT).

2. DMAP for Stiffness Matrix Equilibrium Check

The DMAP for performing the rigid body displacement stiffness matrix equilibrium check is shown below. The calculations are done in MSC NASTRAN under SOL 103 (real eigen) in version 70.5.

DMAP

```
$ MSC v 70.5 Stiffness Matrix Equilibrium Check DMAP for SOL 103

$ This DMAP will perform a stiffness matrix equilibrium check on the
$ G, N, F and A-set free-free stiffness matrices in SOL 103. The check
$ is made by multiplying the stiffness matrix by a set of 6 rigid body
$ displacement vectors which should produce 6 force vectors of zero
$ magnitude for all DOF's. Presence of nonzero forces of large magnitude
$ indicates a problem with the stiffness matrix due to, for example,
$ grounding of some DOF's.

$ If the G, N, F and A-sets are all unique, then output for all sets is
$ obtained. However, the following applies:

$ 1) If there are no MPC's or rigid elements then the G and N-sets are
$ identical and no output is generated for the N-set.

$ 2) If there are no SPC's then the N and F-sets are identical and no
$ output is generated for the F-set.

$ 3) If there are no omitted DOF's than the F and A-sets are identical
$ and no output is generated for the A-set.

$ There are 3 forms of force output from this DMAP (all of which should
$ be zero if the stiffness matrix is perfectly clean):

$ (1) All Forces: Output of forces on all DOF's exceeding a user
$ specified filter (FILTERA) for all 6 rigid body displacement
$ vectors. This Nx6 matrix is printed out (where N = no. of DOF's).

$ (2) Normalized Forces: Above output normalized by dividing the forces
$ for a DOF by the diagonal stiffness for that DOF. This avoids
$ scaling problems in interpreting All Forces. Output of forces on
$ all DOF's exceeding a user specified filter (FILTERN) for all 6
$ rigid body displacement vectors is produced. This Nx6 matrix is
$ printed out depending on a parameter described below.

$ (3) Forces Summed: The resultants of the individual DOF forces is
$ produced by premultiplying the All Force matrix by the transpose of
$ the rigid body displacement matrix. This 6x6 matrix is printed out
$ depending on a parameter described below.

$ The order that the above is printed out is: (3), (1), (2) for each of
$ the displacement sets

$ Parameters used (default values in parentheses can be overriden on Bulk
$ Data PARAM cards) are:

$ FILTERA: Filter for printing All Forces, default=1.0E-2
$ FILTERN: Filter for printing Norm'd Forces, default=1.0E-5
$ NORMG : Print G-set Norm'd Forces if > 0, default=0 (no print)
$ NORMN : Print N-set Norm'd Forces if > 0, default=0 (no print)
$ NORMF : Print F-set Norm'd Forces if > 0, default=0 (no print)
$ NORMA : Print A-set Norm'd Forces if > 0, default=0 (no print)
$ SUMG  : Print G-set Forces Summed if > 0, default=1 (print)
$ SUMN  : Print N-set Forces Summed if > 0, default=1 (print)
$ SUMF  : Print F-set Forces Summed if > 0, default=1 (print)
$ SUMA  : Print A-set Forces Summed if > 0, default=1 (print)
$ EQUILPT: Grid Pt about which R.B. vectors calc'd, default=0 (basic origin)
```

\$ DMAP PROGRAMMER'S NOTE: IF DEFAULTS FOR FILTERA AND/OR FILTERN ARE TO
\$ BE CHANGED, THEY MUST BE CHANGED IN 2 PLACES IN THIS DMAP; IN SUBDMAP
\$ SEKR AND IN SUBDMAP SEKMR

\$ There are several places in this DMAP where 2 uses of the module
\$ DIAGONAL are made where 1 use should have sufficed. This is due to
\$ an error in the MSC DIAGONAL module that has been reported.

```

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
1 COMPILE SUBDMAP=SEKR,SOUIN=MSCSOU,NOREF,NOLIST

2 ALTER 2

3 TYPE DB,BGPDTS,CSTMS
4 TYPE PARM,,RS,Y,FILTERA,FILTERN
5 FILTERA=1.0E-2
6 FILTERN=1.0E-5

7 ALTER 12

$ Perform G-set equilibrium check

8 VECPLOT,,BGPDTS,EQEXINS,CSTMS,,,,
   RBGL/V,Y,EQUILPT=0//4                                $ CREATE RBGL
9 TRNSP      RBGL/RBGLT                               $ 

10 MPYAD     KGG,RBGLT,/KPHIG                         $ ALL FORCES

11 PARAM      // 'NOP' /V,Y,SUMG=1                     $ FORCES SUMMED
12 IF (SUMG = 1) THEN
13   MPYAD     RBGL,KPHIG,/KPHG6
14   MESSAGE   // 'KPHG6 is G-set Forces Summed'
15   MATPRN   KPHG6//                                 $ 
16 ENDIF

17 MESSAGE   // 'KPHIG is All Forces for the G-set'
18 MATGPR    GPLS,USET,SILS,KPHIG// 'G'///V,Y,FILTERA $ PRINT G-SET
                                                 $ ALL FORCES

19 PARAM      // 'NOP' /V,Y,NORMG=0                   $ FORCES NORM'D
20 IF (NORMG = 1) THEN
21   DIAGONAL KGG/KGGD/'SQUARE'/1.0                  $ NEED FOR MSC
22   DIAGONAL KGGD/KGGDM1/'SQUARE'/-1.0              $ DIAGONAL ERR.
23   MPYAD     KGGDM1,KPHIG,/KPHIGN/
24   MESSAGE   // 'KPHIGN is G-set Normalized Forces'
25   MATGPR    GPLS,USET,SILS,KPHIGN// 'G'///V,Y,FILTERN $ 
26 ENDIF

$ Perform N-set equilibrium check if there are any M-set DOF's

27 IF (NOMSET > 0) THEN                                $
28   VEC      USET/VGN/'G'/'N'/'COMP'                 $ 
29   PARTN   RBGL,VGN,/RBNN,,,/1                      $ 
30   TRNSP   RBNN/RBNNT                               $ 

31 MPYAD     KNN,RBNNT,/KPHIN/                        $ ALL FORCES

32 PARAM      // 'NOP' /V,Y,SUMN=1                   $ FORCES SUMMED
33 IF (SUMN = 1) THEN
34   MPYAD     RBNN,KPHIN,/KPHN6
35   MESSAGE   // 'KPHN6 is N-set Forces Summed'
36   MATPRN   KPHN6//                                 $ 
37 ENDIF

38 MESSAGE   // 'KPHIN is All Forces for the N-set' /
39 MATGPR    GPLS,USET,SILS,KPHIN// 'N'///V,Y,FILTERA $ PRINT N-SET
                                                 $ ALL FORCES

```

```

40      PARAM    // 'NOP' /V,Y,NORMN=0                      $ FORCES NORM'D
41      IF (NORMN = 1) THEN
42          DIAGONAL KNN/KNND/'SQUARE'/1.0                  $ NEED FOR MSC
43          DIAGONAL KNN/KNNDM1/'SQUARE'/-1.0               $ DIAGONAL ERR.
44          MPYAD   KNNDM1,KPHIN,/KPHINN/
45          MESSAGE // 'KPHINN is N-set Normalized Forces'/
46          MATGPR  GPLS,USET,SILS,KPHINN// 'N'///V,Y,FILTERN
47      ENDIF
48
49      ELSE
50          MESSAGE // '*****'/
51          MESSAGE // 'N-SET CHECK NOT DONE (SAME AS G-SET)'/
52          MESSAGE // '*****'
53      ENDIF
54
55      ALTER 15
56
57      $ Perform F-set equilibrium check if there are any S-set DOF's
58
59      IF (NOSSET > 0) THEN
60
61          VEC      USET/VGF/'G'/'F'/'COMP'                 $ 
62          PARTN   RBGL,VGF,/RBFF,,,/1                     $ 
63          TRNSP   RBFF/RBFFT                                $ 
64
65          MPYAD   KFF,RBFFT,/KPHIF/                      $ ALL FORCES
66
67          PARAM    // 'NOP' /V,Y,SUMF=1                  $ FORCES SUMMED
68          IF (SUMF = 1) THEN
69              MPYAD   RBFF,KPHIF,/KPHF6                  $ 
70              MESSAGE // 'KPHF6 is F-set Forces Summed'/
71              MATPRN  KPHF6//                           $ 
72          ENDIF
73
74          MESSAGE // 'KPHIF is All Forces for the F-set' /
75          MATGPR  GPLS,USET,SILS,KPHIF// 'F'///V,Y,FILTERA
76
77          PARAM    // 'NOP' /V,Y,NORMF=0                  $ FORCES NORM'D
78          IF (NORMF = 1) THEN
79              DIAGONAL KFF/KFFD/'SQUARE'/1.0             $ NEED FOR MSC
80              DIAGONAL KFFD/KFFDM1/'SQUARE'/-1.0        $ DIAGONAL ERR.
81              MPYAD   KFFDM1,KPHIF,/KPHIFN/
82              MESSAGE // 'KPHIFN is F-set Normalized Forces'/
83              MATGPR  GPLS,USET,SILS,KPHIFN// 'F'///V,Y,FILTERN
84          ENDIF
85
86          ELSE
87              MESSAGE // '*****'
88              MESSAGE // 'F-SET CHECK NOT DONE (SAME AS N-SET)'/
89              MESSAGE // '*****'
90      ENDIF
91
92      ALTER 92
93
94      CALL     DBSTORE RBGL,,,//1/1//      '/0/           $ STORE RBGL
95
96      ENDALTER

```

```

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
$ Perform A-set check, depending on parameters

83 COMPILE SUBDMAP=SEKMR ,SOUIN=MSCSOU ,NOREF ,NOLIST

84 ALTER 2

85   TYPE PARM , ,RS,Y,FILTERA,FILTERN
86   FILTERA=1.0E-2
87   FILTERN=1.0E-5

88 ALTER 46

89 CALL      DBFETCH /RBGL,,,,/1/1/0/0/0          $ FETCH RBGL

$ Perform A-set equilibrium check if there are any O-set DOF's

90 IF (NOOSET > 0) THEN

91   VEC      USET/VGA/'G'/'A'/'COMP'
92   PARTN   RBGL,VGA,/RBA,,,/1
93   TRNSP   RBA/RBAAT

94   MPYAD   KAA,RBAAT,/KPHIA/          $ ALL FORCES

95   PARAM    // 'NOP' /V,Y,SUMA=1
96   IF (SUMA = 1) THEN
97     MPYAD   RBA,KPHIA,/KPHA6
98     MESSAGE  // 'KPHA6 is A-set Forces Summed'/
99     MATPRN  KPHA6//          $ FORCES SUMMED
100  ENDIF

101  MESSAGE  // 'KPHIA is All Forces for the A-set' /
102  MATGPR   GPLS,USET,SILS,KPHIA// 'A'///V,Y,FILTERA          $ PRINT A-SET
103  $ ALL FORCES

103  PARAM    // 'NOP' /V,Y,NORMA=0
104  IF (NORMA = 1) THEN
105    DIAGONAL KAA/KAAD/'SQUARE'/1.0
106    DIAGONAL KAADM1/ 'SQUARE'/-1.0
107    MPYAD   KAADM1,KPHIA,/KPHIAN/
108    MESSAGE  // 'KPHIAN is A-set Normalized Forces'/
109    MATGPR   GPLS,USET,SILS,KPHIAN// 'A'///V,Y,FILTERN          $ FORCES NORM'D
110  ENDIF

111 ELSE

112   MESSAGE  // '*****'/
113   MESSAGE  // 'A-SET CHECK NOT DONE (SAME AS F-SET)'/
114   MESSAGE  // '*****'/          NEED FOR MSC
115 ENDIF

116 ENDALTER

$ End equilibrium check DMAP

```

Explanation of DMAP Statements

(Numbers 1 – 116, below, correspond to those on each line in above listing of DMAP statements)

I. Modify subdmap SEKR, where KGG, KNN and KFF exist

A. Identify datablocks needed from database and defaults for parameters (statements 2-6)

- 2 Alter near beginning of SEKR to identify datablocks needed from the database.
- 3 Datablocks BGPDTS and CSTMS are needed from the database for use in module VECPLOT that generates the 6 rigid body vectors used in the equilibrium check.
- 4-6 FILTERA,N are defined and default values are set.

B. Perform G-set equilibrium check (statements 7-26)

- 7 The G-set and N-set checks can be done near the beginning of subdmap SEKR since KGG and KNN are passed to SEKR.
- 8 VECPLOT generates a $6 \times N_G$ (=no. DOF's) matrix, RBGL, where each row is a rigid body displacement vector for the G-set.
- 9 TRNSP transposes RBGL to RBGLT since we want a $N_G \times 6$ matrix of rigid body displacement vectors.
- 10 KPHIG is the matrix of "All Forces", and is always calculated for the G-set in this DMAP.
- 11-16 If SUMG = 1 (and it will be unless the user has a Bulk Data PARAM card with it defined different than the default) then calculate and print the 6×6 "Forces Summed" (equation 3) by multiplying KPHIG by RBGL (the transpose of RBGLT).
- 17-18 Print out the "All Force" matrix for the G-set.
- 19-26 If NORMG = 1 (and it will not be unless the user has a Bulk Data PARAM card with it specified as 1) then calculate and print the $N_G \times 6$ matrix of "Normalized Forces". The DIAGONAL module extracts the diagonal of KGG and inverts it so we can divide each row of the unnormalized forces (KPHIG) by the diagonal stiffness terms.

C. Perform N-set equilibrium check (statements 27-52)

- 27 The N-set differs from the G-set by the introduction of rigid elements and/or multi-point constraints (MPC's) which populate the M-set. The N-set check is performed only if it is different than the G-set. Parameter NOMSET gives the number of DOF's in the M-set. If NOMSET > 0 then the N and G-sets are distinct and the N-set check is done.
- 28-29 Partition RBGL (the G-set rigid body displacement vectors) to the N-set.
- 33-47 Perform operations on the N-set that are similar to ones shown in statements 10-26 for the G-set.

D. Perform F-set equilibrium check (statements 53-79)

- 53 Alter in SEKR after datablock KFF, the F-set stiffness matrix is available.
- 54-79 Similar to the operations on the N-set. For the F-set they are only done if the F-set differs from the N-set; which will be the case if there is an S-set (single point constraints).

E. Store RBGL and end the alter in subdmap SEKR

- 80-81 At the end of subdmap SEKR the rigid body vectors (RBGL) are stored on the database.
This is done since they will be needed for the A-set equilibrium check which is done in
subdmap SEKMR.
- 82 End the alter in subdmap SEKR

II. Modify subdmap SEKMR, where KAA exists

A. Identify and define defaults for parameters (statements 84-87)

- 84 Alter near beginning of SEKMR to identify parameters in TYPE statement.
- 85-87 Parameters FILTERA,N are local to each subdmap and need to be defined each time they
are used.

B. Get RBGL from the database(statements 84-87)

- 88-89 Alter at end of subdmap SEKMR to begin equilibrium check on the A-set stiffness matrix.
Fetch RBGL from the database.

C. Perform A-set equilibrium check (statements 90-116)

- 90-116 Similar to the operations on the N-set or F-set. They are only done if the A-set differs
from the F-set; which will be the case if there is an O-set (omitted DOF's).

3. Example Problem 1 – Bar Model With Inadvertent Constraint

3.1 Example Problem 1 Description

This is a simple BAR problem that is run twice; once as a clean model with no equilibrium check problems and again with a spurious constraint that causes equilibrium check problems. The model consists of 4 grid points, 2 CBAR elements and one rigid element and is shown in Figure 1. The bar model is 3 dimensional to better illustrate the effects of the equilibrium check problems.

The first run is with nothing wrong with the model and the equilibrium check is clean. The output listing for this run is shown in section 3.1.1. Notice in the input deck that “Normalized Forces” are requested only for the N-set, as indicated by the PARAM NORMN 1 card (the default is for no “Normalized Forces” output). In addition, the “Forces Summed” output for the A-set is not printed out due to the Bulk Data input of PARAM SUMA 0. The output from the equilibrium check shows that all matrices are null, indicating a clean model. Notice that there is no output for the F-set since it is the same as the N-set due to the fact that there are no rigid elements or multi-point constraints (MPC’s). Notice that the eigenvalue output shows 6 clean rigid body modes (eigenvalues and eigenvectors) and that the element forces and/or stresses are essentially zero. Also, no SPC forces are printed out, even though they were requested. This is due to the fact that they are all zero.

The second run is shown in section 3.1.2. Here, an inadvertent single point constraint is shown in field 8 of GRID 222. This causes the model to be grounded. For the equilibrium check, the model must be in an unrestrained state. Notice in the equilibrium check that the G and N-set checks are clean whereas the F and A-set checks show large values, indicating a problem with the F-set (and therefore for the A-set also). In addition, the eigenvalue summary shows that there are not 6 clean rigid body modes. This fact is also indicated in the element force summary that shows large forces in the 6th mode.

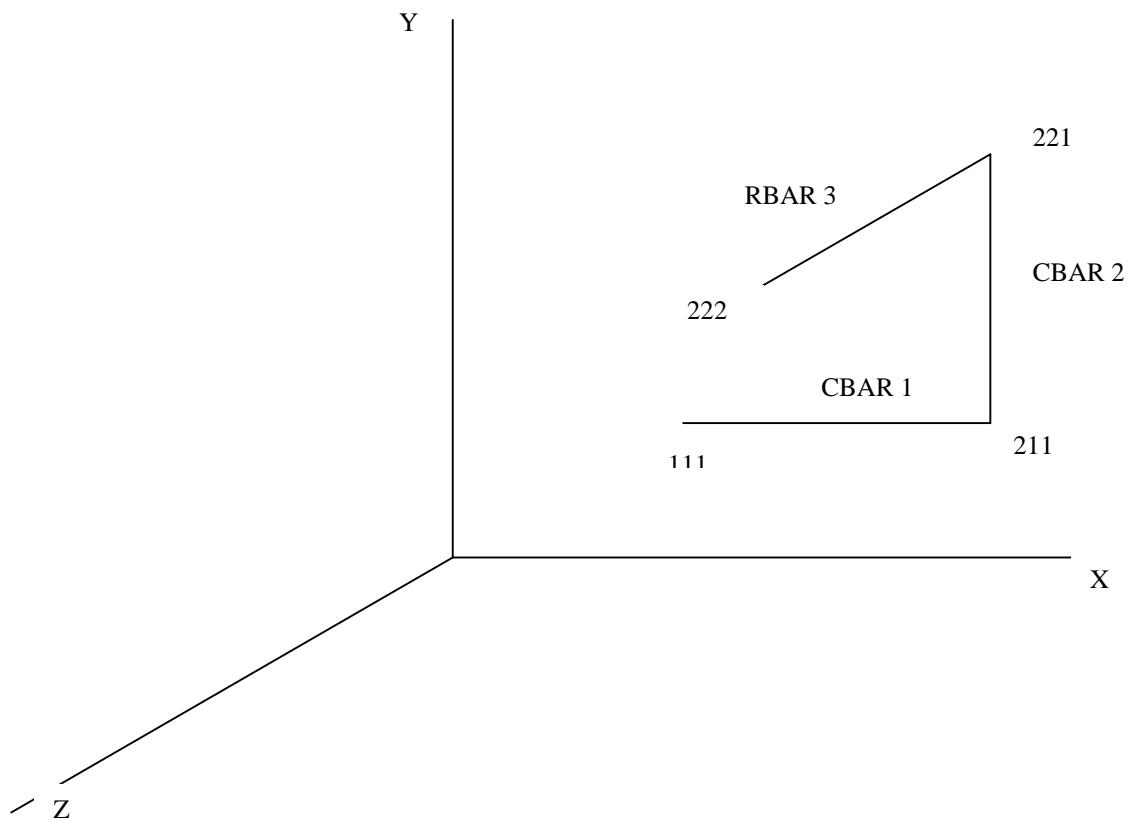


Figure 1 – BAR Model

3.1.1 Output for Example 1 (run a)

DMAP For Stiffness Matrix Equilibrium Check
Example 1 – a: Clean Bar Model
bar_equil_clean.f06

N A S T R A N E X E C U T I V E C O N T R O L D E C K E C H O

```
ID TEST,EQUIL
APP DISP
SOL 103
TIME 5
DIAG 8
$INCLUDE '/u7/case/Convert_UAI_to_MSC/Equil/equil_v705.dmp'
CEND
```

C A S E C O N T R O L D E C K E C H O

```
COUNT1
1      TITLE = TEST OF MSC V70.5 EQUIL DMAP CULLED FROM CBMSC-V705.DMP
2      SUBTITLE = BAR WITH G,N,F,A,SETS.
3      LABEL = FREE-FREE. GIVES CLEAN EQUIL CHECK
4      METHOD = 1
5      DISP = ALL
6      SPCF = ALL
7      ELFORCE = ALL
8      STRESS = ALL
9      BEGIN BULK
```

TEST OF MSC V70.5 EQUIL DMAP CULLED FROM CBMSC-V705.DMP
BAR WITH G,N,F,A,SETS.
FREE-FREE. GIVES CLEAN EQUIL CHECK

AUGUST 22, 2000 MSC/NASTRAN 10/22/98 PAGE 12

^^^KPHG6 IS G-SET FORCES SUMMED
MATRIX KPHG6 (GINO NAME 101) IS A DB PREC
COLUMNS 1 THRU 6 ARE NULL.

^^^KPHIG IS ALL FORCES FOR THE G-SET
KPHIG
POINT VALUE POINT VALUE POINT VALUE POINT VALUE POINT VALUE
COLUMNS 1 (111-T1) THRU 6 (111-R3) ARE NULL.

^^^KPHN6 IS N-SET FORCES SUMMED
MATRIX KPHN6 (GINO NAME 101) IS A DB PREC
COLUMNS 1 THRU 6 ARE NULL.

^^^KPHIN IS ALL FORCES FOR THE N-SET
KPHIN
POINT VALUE POINT VALUE POINT VALUE POINT VALUE POINT VALUE
COLUMNS 1 (111-T1) THRU 6 (111-R3) ARE NULL.

^^^KPHINN IS N-SET NORMALIZED FORCES
KPHINN
POINT VALUE POINT VALUE POINT VALUE POINT VALUE POINT VALUE
COLUMNS 1 (111-T1) THRU 6 (111-R3) ARE NULL.

^^^F-SET CHECK NOT DONE (SAME AS N-SET)

^^^KPHIA IS ALL FORCES FOR THE A-SET
KPHIA
POINT VALUE POINT VALUE POINT VALUE POINT VALUE POINT VALUE
COLUMNS 1 (111-T1) THRU 3 (111-T3) ARE NULL.
COLUMN 4 (211-T1).
COLUMN 5 (211-T2).
COLUMN 6 (211-T3).

TEST OF MSC V70.5 EQUIL DMAP CULLED FROM CBMSC-V705.DMP
 BAR WITH G,N,F,A,SETS.
 FREE-FREE. GIVES CLEAN EQUIL CHECK

AUGUST 22, 2000 MSC/NASTRAN 10/22/98 PAGE 18

MODE NO.	EXTRACTION ORDER	EIGENVALUE	R E A L E I G E N V A L U E S			GENERALIZED MASS	GENERALIZED STIFFNESS
			RADIANS	CYCLES			
1	7	1.000000E-35	3.162278E-18	5.032922E-19		1.295500E-03	1.295500E-38
2	8	1.000000E-35	3.162278E-18	5.032922E-19		2.591000E-03	2.591000E-38
3	9	1.000000E-35	3.162278E-18	5.032922E-19		1.295500E-03	1.295500E-38
4	1	1.087299E-07	3.297421E-04	5.248009E-05		2.575956E-03	2.800833E-10
5	5	-2.013442E-07	4.487140E-04	7.141504E-05		6.011160E-03	-1.210312E-09
6	6	-2.158883E-07	4.646378E-04	7.394941E-05		5.255881E-03	-1.134683E-09
7	2	3.077074E+07	5.547138E+03	8.828544E+02		3.454989E-03	1.063126E+05
8	3	1.157854E+09	3.402725E+04	5.415605E+03		3.886500E-03	4.500000E+06
9	4	1.161819E+09	3.408546E+04	5.424870E+03		3.913527E-03	4.546810E+06

TEST OF MSC V70.5 EQUIL DMAP CULLED FROM CBMSC-V705.DMP
BAR WITH G,N,F,A,SETS.

FREE-FREE. GIVES CLEAN EQUIL CHECK
EIGENVALUE = 1.000000E-35

CYCLES = 5.032921E-19

R E A L E I G E N V E C T O R

AUGUST 22, 2000 MSC/NASTRAN 10/22/98 PAGE 20

1

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
111	G	.0	.0	1.000000E+00	.0	1.000000E-01	.0
211	G	.0	.0	.0	.0	1.000000E-01	.0
221	G	.0	.0	.0	.0	1.000000E-01	.0
222	G	1.000000E+00	.0	.0	.0	1.000000E-01	.0

EIGENVALUE = 1.000000E-35

CYCLES = 5.032921E-19

R E A L E I G E N V E C T O R

NO.

2

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
111	G	.0	.0	.0	-1.000000E-01	-1.000000E-01	.0
211	G	.0	.0	1.000000E+00	-1.000000E-01	-1.000000E-01	.0
221	G	.0	.0	.0	-1.000000E-01	-1.000000E-01	.0
222	G	-1.000000E+00	1.000000E+00	.0	-1.000000E-01	-1.000000E-01	.0

EIGENVALUE = 1.000000E-35

CYCLES = 5.032921E-19

R E A L E I G E N V E C T O R

NO.

3

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
111	G	.0	.0	.0	1.000000E-01	.0	.0
211	G	.0	.0	.0	1.000000E-01	.0	.0
221	G	.0	.0	1.000000E+00	1.000000E-01	.0	.0
222	G	.0	-1.000000E+00	1.000000E+00	1.000000E-01	.0	.0

EIGENVALUE = 1.087299E-07

CYCLES = 5.248009E-05

R E A L E I G E N V E C T O R

NO.

4

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
111	G	-5.266199E-02	9.824955E-01	.0	.0	.0	-1.052662E-01
211	G	-5.266199E-02	-7.016645E-02	.0	.0	.0	-1.052662E-01
221	G	1.000000E+00	-7.016645E-02	.0	.0	.0	-1.052662E-01
222	G	1.000000E+00	-7.016645E-02	.0	.0	.0	-1.052662E-01

EIGENVALUE = -2.013442E-07

CYCLES = 7.141504E-05

R E A L E I G E N V E C T O R

NO.

5

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
111	G	1.000000E+00	-6.965255E-01	.0	.0	.0	2.513830E-02
211	G	1.000000E+00	-4.451425E-01	.0	.0	.0	2.513830E-02
221	G	7.486170E-01	-4.451425E-01	.0	.0	.0	2.513830E-02
222	G	7.486170E-01	-4.451425E-01	.0	.0	.0	2.513830E-02

EIGENVALUE = -2.158883E-07

CYCLES = 7.394941E-05

R E A L E I G E N V E C T O R

NO.

6

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
111	G	5.507156E-01	3.766914E-01	.0	.0	.0	6.233086E-02
211	G	5.507156E-01	1.000000E+00	.0	.0	.0	6.233086E-02
221	G	-7.259294E-02	1.000000E+00	.0	.0	.0	6.233086E-02
222	G	-7.259294E-02	1.000000E+00	.0	.0	.0	6.233086E-02

TEST OF MSC V70.5 EQUIL DMAP CULLED FROM CBMSC-V705.DMP
 BAR WITH G,N,F,A,SETS.
 FREE-FREE. GIVES CLEAN EQUIL CHECK

AUGUST 22, 2000 MSC/NASTRAN 10/22/98 PAGE 26

EIGENVALUE = 1.000000E-35

ELEMENT ID.	F O R C E S		I N B A R E L E M E N T S				(C B A R)		
	BEND-MOMENT	END-A	BEND-MOMENT	END-B	- SHEAR -	AXIAL	FORCE	TORQUE	
1	PLANE 1 .0	PLANE 2 .0	PLANE 1 .0	PLANE 2 7.275958E-11	PLANE 1 .0	PLANE 2 -7.275958E-12	.0	.0	
2	PLANE 1 .0	PLANE 2 .0	PLANE 1 .0	PLANE 2 .0	PLANE 1 .0	PLANE 2 .0	.0	.0	

EIGENVALUE = 1.000000E-35

ELEMENT ID.	F O R C E S		I N B A R E L E M E N T S				(C B A R)		
	BEND-MOMENT	END-A	BEND-MOMENT	END-B	- SHEAR -	AXIAL	FORCE	TORQUE	
1	PLANE 1 .0	PLANE 2 .0	PLANE 1 .0	PLANE 2 -7.275958E-11	PLANE 1 .0	PLANE 2 7.275958E-12	.0	.0	
2	PLANE 1 .0	PLANE 2 .0	PLANE 1 7.275958E-11	PLANE 2 .0	PLANE 1 -7.275958E-12	PLANE 2 .0	.0	.0	

EIGENVALUE = 1.000000E-35

ELEMENT ID.	F O R C E S		I N B A R E L E M E N T S				(C B A R)		
	BEND-MOMENT	END-A	BEND-MOMENT	END-B	- SHEAR -	AXIAL	FORCE	TORQUE	
1	PLANE 1 .0	PLANE 2 .0	PLANE 1 .0	PLANE 2 .0	PLANE 1 .0	PLANE 2 .0	.0	.0	
2	PLANE 1 .0	PLANE 2 .0	PLANE 1 -7.275958E-11	PLANE 2 .0	PLANE 1 7.275958E-12	PLANE 2 .0	.0	.0	

EIGENVALUE = 1.087299E-07

ELEMENT ID.	F O R C E S		I N B A R E L E M E N T S				(C B A R)		
	BEND-MOMENT	END-A	BEND-MOMENT	END-B	- SHEAR -	AXIAL	FORCE	TORQUE	
1	PLANE 1 2.910383E-11	PLANE 2 .0	PLANE 1 1.746230E-10	PLANE 2 .0	PLANE 1 -1.455192E-11	PLANE 2 .0	.0	.0	
2	PLANE 1 .0	PLANE 2 1.164153E-10	PLANE 1 .0	PLANE 2 4.365575E-11	PLANE 1 .0	PLANE 2 7.275958E-12	1.455192E-10	.0	

EIGENVALUE = -2.013442E-07

ELEMENT ID.	F O R C E S		I N B A R E L E M E N T S				(C B A R)		
	BEND-MOMENT	END-A	BEND-MOMENT	END-B	- SHEAR -	AXIAL	FORCE	TORQUE	
1	PLANE 1 5.820766E-11	PLANE 2 .0	PLANE 1 5.820766E-11	PLANE 2 .0	PLANE 1 .0	PLANE 2 .0	.0	.0	
2	PLANE 1 .0	PLANE 2 .0	PLANE 1 .0	PLANE 2 -1.455192E-10	PLANE 1 .0	PLANE 2 1.455192E-11	-1.746230E-10	.0	

EIGENVALUE = -2.158883E-07

ELEMENT ID.	F O R C E S		I N B A R E L E M E N T S				(C B A R)		
	BEND-MOMENT	END-A	BEND-MOMENT	END-B	- SHEAR -	AXIAL	FORCE	TORQUE	
1	PLANE 1 5.820766E-11	PLANE 2 .0	PLANE 1 2.037268E-10	PLANE 2 .0	PLANE 1 -1.455192E-11	PLANE 2 .0	-1.164153E-10	.0	
2	PLANE 1 .0	PLANE 2 -3.492460E-10	PLANE 1 .0	PLANE 2 1.455192E-11	PLANE 1 .0	PLANE 2 -3.637979E-11	.0	.0	

TEST OF MSC V70.5 EQUIL DMAP CULLED FROM CBMSC-V705.DMP
 BAR WITH G,N,F,A,SETS.
 FREE-FREE. GIVES CLEAN EQUIL CHECK
 EIGENVALUE = 1.000000E-35

AUGUST 22, 2000 MSC/NASTRAN 10/22/98 PAGE 39

ELEMENT ID.	S T R E S S E S I N B A R E L E M E N T S				(C B A R)		
	SA1 SB1	SA2 SB2	SA3 SB3	SA4 SB4	AXIAL STRESS	SA-MAX SB-MAX	SA-MIN SB-MIN	M.S.-T M.S.-C
1 .0	.0	.0	.0	.0	.0	.0	.0
	.0	.0	.0	.0		.0	.0
2 .0	.0	.0	.0	.0	.0	.0	.0
	.0	.0	.0	.0		.0	.0

EIGENVALUE = 1.000000E-35

ELEMENT ID.	S T R E S S E S I N B A R E L E M E N T S				(C B A R)		
	SA1 SB1	SA2 SB2	SA3 SB3	SA4 SB4	AXIAL STRESS	SA-MAX SB-MAX	SA-MIN SB-MIN	M.S.-T M.S.-C
1 .0	.0	.0	.0	.0	.0	.0	.0
	.0	.0	.0	.0		.0	.0
2 .0	.0	.0	.0	.0	.0	.0	.0
	.0	.0	.0	.0		.0	.0

EIGENVALUE = 1.000000E-35

ELEMENT ID.	S T R E S S E S I N B A R E L E M E N T S				(C B A R)		
	SA1 SB1	SA2 SB2	SA3 SB3	SA4 SB4	AXIAL STRESS	SA-MAX SB-MAX	SA-MIN SB-MIN	M.S.-T M.S.-C
1 .0	.0	.0	.0	.0	.0	.0	.0
	.0	.0	.0	.0		.0	.0
2 .0	.0	.0	.0	.0	.0	.0	.0
	.0	.0	.0	.0		.0	.0

EIGENVALUE = 1.087299E-07

ELEMENT ID.	S T R E S S E S I N B A R E L E M E N T S				(C B A R)		
	SA1 SB1	SA2 SB2	SA3 SB3	SA4 SB4	AXIAL STRESS	SA-MAX SB-MAX	SA-MIN SB-MIN	M.S.-T M.S.-C
1 .0	.0	.0	.0	.0	.0	.0	.0
	.0	.0	.0	.0		.0	.0
2 .0	.0	.0	.0	.0	1.455192E-10	1.455192E-10	1.455192E-10
	.0	.0	.0	.0		1.455192E-10	1.455192E-10

EIGENVALUE = -2.013442E-07

ELEMENT ID.	S T R E S S E S I N B A R E L E M E N T S				(C B A R)		
	SA1 SB1	SA2 SB2	SA3 SB3	SA4 SB4	AXIAL STRESS	SA-MAX SB-MAX	SA-MIN SB-MIN	M.S.-T M.S.-C
1 .0	.0	.0	.0	.0	.0	.0	.0
	.0	.0	.0	.0		.0	.0
2 .0	.0	.0	.0	.0	-1.746230E-10	-1.746230E-10	-1.746230E-10
	.0	.0	.0	.0		-1.746230E-10	-1.746230E-10

EIGENVALUE = -2.158883E-07

ELEMENT ID.	S T R E S S E S I N B A R E L E M E N T S				(C B A R)		
	SA1 SB1	SA2 SB2	SA3 SB3	SA4 SB4	AXIAL STRESS	SA-MAX SB-MAX	SA-MIN SB-MIN	M.S.-T M.S.-C
1 .0	.0	.0	.0	.0	-1.164153E-10	-1.164153E-10	-1.164153E-10
	.0	.0	.0	.0		-1.164153E-10	-1.164153E-10
2 .0	.0	.0	.0	.0	.0	.0	.0
	.0	.0	.0	.0		.0	.0

* * * END OF JOB * * *

3.1.2 Output for Example 1 (run b)

DMAP For Stiffness Matrix Equilibrium Check
Example 1 – a: Bar Model With Inadvertent Constraint

bar_equil_bad6

N A S T R A N E X E C U T I V E C O N T R O L D E C K E C H O

```
ID TEST,EQUIL
APP DISP
SOL 103
TIME 5
DIAG 8
$INCLUDE '/u7/case/Convert_UAI_to_MSC/Equil/equil_v705.dmp'
CEND
```

CARD	CASE	CONTROL	DECK	ECHO
COUNT				
1	TITLE = TEST OF MSC V70.5 EQUIL DMAP CULLED FROM CBMSC-V705.DMP			
2	SUBTITLE = BAR WITH G,N,F,A,SETS.			
3	LABEL = SHOULD BE FREE-FREE BUT HAS INADVERTANT SPC			
4	METHOD = 1			
5	DISP = ALL			
6	SPCF = ALL			
7	ELFORCE = ALL			
8	STRESS = ALL			
9	BEGIN BULK			

CARD	S	O	R	T	E	D	B	U	L	K	D	A	T	A	E	C	H	O			
COUNT	.	1	..	2	..	3	..	4	..	5	..	6	..	7	..	8	..	9	..	10	.
1-	ASET1	123		111		211		221													
2-	CBAR	1		10		111		211		0.		1.		0.							
3-	CBAR	2		10		211		221		0.		0.		1.							
4-	CBAR	3		10		221		222		0.		1.		0.							
5-	EIGR	1		GIV		0.		1000.		9		9									+E1
6-	+E1	MAX																			
7-	GRID	111				10.		10.		10.											
8-	GRID	211				20.		10.		10.											
9-	GRID	221				20.		20.		10.											
10-	GRID	222				20.		20.		20.					2						
11-	GRID	223				20.		20.		20.											
12-	MAT1	1		10.+6				.3		.1											
13-	PARAM	GRDPNT	0																		
14-	PARAM	NORMN	1																		
15-	PARAM	SUMA	0																		
16-	PARAM	USETPRT	1																		
17-	PARAM	USESEL	-1																		
18-	PARAM	WTMASS	.002591																		
19-	PBAR	10		1		1.0		1.0		1.0		1.0		1.0							
20-	RBAR	3		222		223		123456													123456
	ENDDATA																				

^^^KPHG6 IS G-SET FORCES SUMMED
MATRIX KPHG6 (GINO NAME 101) IS A DB PREC 6 COLUMN X 6 ROW SQUARE MATRIX.
COLUMNS 1 THRU 6 ARE NULL.

^^^KPHIG IS ALL FORCES FOR THE G-SET
KPHIG
POINT VALUE POINT VALUE POINT VALUE POINT VALUE POINT VALUE
COLUMNS 1 (111-T1) THRU 6 (111-R3) ARE NULL.

^^^KPHN6 IS N-SET FORCES SUMMED
MATRIX KPHN6 (GINO NAME 101) IS A DB PREC 6 COLUMN X 6 ROW SQUARE MATRIX.
COLUMNS 1 THRU 6 ARE NULL.

^^^KPHIN IS ALL FORCES FOR THE N-SET
KPHIN
POINT VALUE POINT VALUE POINT VALUE POINT VALUE POINT VALUE
COLUMNS 1 (111-T1) THRU 6 (111-R3) ARE NULL.

^^^KPHINN IS N-SET NORMALIZED FORCES
KPHINN
POINT VALUE POINT VALUE POINT VALUE POINT VALUE POINT VALUE
COLUMNS 1 (111-T1) THRU 6 (111-R3) ARE NULL.

^^^KPHF6 IS F-SET FORCES SUMMED
 MATRIX KPHF6 (GINO NAME 101) IS A DB PREC 6 COLUMN X 6 ROW SQUARE MATRIX.
 COLUMNS 1 THRU 1 ARE NULL.
 COLUMN 2 ROWS 2 THRU 6 -----
 ROW 2) 1.2000D+05 0.0000D+00 -2.4000D+06 0.0000D+00 2.4000D+06
 COLUMNS 3 THRU 3 ARE NULL.
 0COLUMN 4 ROWS 2 THRU 6 -----
 ROW 2) -2.4000D+06 0.0000D+00 4.8000D+07 0.0000D+00 -4.8000D+07
 COLUMNS 5 THRU 5 ARE NULL.
 0COLUMN 6 ROWS 2 THRU 6 -----
 ROW 2) 2.4000D+06 0.0000D+00 -4.8000D+07 0.0000D+00 4.8000D+07

^^^KPHIF IS ALL FORCES FOR THE F-SET
 KPHIF

POINT	VALUE	POINT	VALUE	POINT	VALUE	POINT	VALUE	POINT	VALUE
COLUMNS	1 (	111-T1)	THRU	1 (	111-T1)	ARE NULL.			
COLUMN	2 (	111-T2).		221 R1	-6.00000E+05		222 R1	-6.00000E+05	
221 T2	1.20000E+05								
COLUMNS	3 (	111-T3)	THRU	3 (	111-T3)	ARE NULL.			
COLUMN	4 (	111-R1).		221 R1	1.20000E+07		222 R1	1.20000E+07	
221 T2	-2.40000E+06								
COLUMNS	5 (	111-R2)	THRU	5 (	111-R2)	ARE NULL.			
COLUMN	6 (	111-R3).		221 R1	-1.20000E+07		222 R1	-1.20000E+07	
221 T2	2.40000E+06								

^^^KPHIA IS ALL FORCES FOR THE A-SET
KPHIA

POINT	VALUE	POINT	VALUE	POINT	VALUE	POINT	VALUE	POINT	VALUE
COLUMN	1 (	111-T1).							
COLUMN	2 (	111-T2).	211 T3 1.50000E+04	221 T2 1.50000E+04	221 T3 -1.50000E+04				
COLUMNS	3 (	111-T3) THRU	3 (	111-T3)	ARE NULL.				
COLUMN	4 (	211-T1).	211 T3 -3.00000E+05	221 T2 -3.00000E+05	221 T3 3.00000E+05				
COLUMN	5 (	211-T2).							
COLUMN	6 (	211-T3).	211 T3 3.00000E+05	221 T2 3.00000E+05	221 T3 -3.00000E+05				

TEST OF MSC V70.5 EQUIL DMAP CULLED FROM CBMSC-V705.DMP
 BAR WITH G,N,F,A,SETS.
 SHOULD BE FREE-FREE BUT HAS INADVERTANT SPC

SEPTEMBER 15, 2000 MSC/NASTRAN 10/22/98 PAGE 20

MODE NO.	EXTRACTION ORDER	EIGENVALUE	R E A L E I G E N V A L U E S			GENERALIZED MASS	GENERALIZED STIFFNESS
			RADIANS	CYCLES			
1	9	1.000000E-35	3.162278E-18	5.032922E-19	2.591000E-03	2.591000E-38	
2	7	-2.511024E-08	1.584621E-04	2.522002E-05	5.379364E-03	-1.350771E-10	
3	8	4.101958E-08	2.025329E-04	3.223411E-05	4.545489E-03	1.864541E-10	
4	6	-1.034537E-07	3.216421E-04	5.119093E-05	8.481354E-03	-8.774272E-10	
5	3	-1.329127E-07	3.645720E-04	5.802344E-05	5.911860E-03	-7.857616E-10	
6	5	1.034727E+07	3.216717E+03	5.119564E+02	8.323405E-03	8.612449E+04	
7	4	2.424661E+07	4.924085E+03	7.836924E+02	2.983127E-03	7.233073E+04	
8	2	7.777793E+08	2.788870E+04	4.438624E+03	5.182508E-03	4.030848E+06	
9	1	1.159838E+09	3.405640E+04	5.420244E+03	1.950062E-03	2.261756E+06	

TEST OF MSC V70.5 EQUIL DMAP CULLED FROM CBMSC-V705.DMP
BAR WITH G,N,F,A,SETS.

SHOULD BE FREE-FREE BUT HAS INADVERTANT SPC

EIGENVALUE = 1.000000E-35

CYCLES = 5.032921E-19

R E A L E I G E N V E C T O R N O .

1

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
111	G	.0	.0	1.000000E+00	.0	1.000000E-01	.0
211	G	.0	.0	.0	.0	1.000000E-01	.0
221	G	.0	.0	.0	.0	1.000000E-01	.0
222	G	1.000000E+00	.0	.0	.0	1.000000E-01	.0
223	G	1.000000E+00	.0	.0	.0	1.000000E-01	.0

EIGENVALUE = -2.511024E-08

CYCLES = 2.522002E-05

R E A L E I G E N V E C T O R N O .

2

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
111	G	1.000000E+00	-5.119835E-01	-4.370528E-02	2.397531E-02	-2.045582E-02	7.517365E-02
211	G	1.000000E+00	2.397531E-01	1.608529E-01	2.397531E-02	-2.045582E-02	7.517365E-02
221	G	2.482635E-01	2.397531E-01	4.006060E-01	2.397531E-02	-2.045582E-02	7.517365E-02
222	G	4.370528E-02	.0	4.006060E-01	2.397531E-02	-2.045582E-02	7.517365E-02
223	G	4.370528E-02	.0	4.006060E-01	2.397531E-02	-2.045582E-02	7.517365E-02

EIGENVALUE = 4.101958E-08

CYCLES = 3.223411E-05

R E A L E I G E N V E C T O R N O .

3

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
111	G	3.791880E-02	9.347048E-01	-5.392884E-01	-2.737641E-03	-4.607116E-02	-9.620812E-02
211	G	3.791880E-02	-2.737641E-02	-7.857681E-02	-2.737641E-03	-4.607116E-02	-9.620812E-02
221	G	1.000000E+00	-2.737641E-02	-1.059532E-01	-2.737641E-03	-4.607116E-02	-9.620812E-02
222	G	5.392884E-01	.0	-1.059532E-01	-2.737641E-03	-4.607116E-02	-9.620812E-02
223	G	5.392884E-01	.0	-1.059532E-01	-2.737641E-03	-4.607116E-02	-9.620812E-02

EIGENVALUE = -1.034537E-07

CYCLES = 5.119093E-05

R E A L E I G E N V E C T O R N O .

4

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
111	G	-4.427667E-01	1.000000E+00	2.095721E-01	6.704590E-02	-9.634634E-03	-3.295410E-02
211	G	-4.427667E-01	6.704590E-01	3.059184E-01	6.704590E-02	-9.634634E-03	-3.295410E-02
221	G	-1.132257E-01	6.704590E-01	9.763774E-01	6.704590E-02	-9.634634E-03	-3.295410E-02
222	G	-2.095721E-01	.0	9.763774E-01	6.704590E-02	-9.634634E-03	-3.295410E-02
223	G	-2.095721E-01	.0	9.763774E-01	6.704590E-02	-9.634634E-03	-3.295410E-02

EIGENVALUE = -1.329127E-07

CYCLES = 5.802343E-05

R E A L E I G E N V E C T O R N O .

5

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
111	G	-1.232247E-01	-1.614249E-01	3.217597E-01	-6.411303E-02	-6.782403E-02	-4.797053E-02
211	G	-1.232247E-01	-6.411303E-01	1.000000E+00	-6.411303E-02	-6.782403E-02	-4.797053E-02
221	G	3.564806E-01	-6.411303E-01	3.588697E-01	-6.411303E-02	-6.782403E-02	-4.797053E-02
222	G	-3.217597E-01	.0	3.588697E-01	-6.411303E-02	-6.782403E-02	-4.797053E-02
223	G	-3.217597E-01	.0	3.588697E-01	-6.411303E-02	-6.782403E-02	-4.797053E-02

EIGENVALUE = 1.034727E+07

CYCLES = 5.119564E+02

R E A L E I G E N V E C T O R N O .

6

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
111	G	2.628511E-01	7.815064E-01	5.563013E-01	-2.423216E-01	-4.436987E-02	-5.010700E-02
211	G	2.593277E-01	4.550364E-01	1.000000E+00	-2.423216E-01	-4.436987E-02	2.273011E-03
221	G	-1.126026E-01	4.323610E-01	-8.521004E-01	-7.098697E-02	-4.436987E-02	5.465302E-02
222	G	-5.563013E-01	.0	-8.521004E-01	1.003476E-01	-4.436987E-02	5.465302E-02
223	G	-5.563013E-01	.0	-8.521004E-01	1.003476E-01	-4.436987E-02	5.465302E-02

TEST OF MSC V70.5 EQUIL DMAP CULLED FROM CBMSC-V705.DMP
BAR WITH G,N,F,A,SETS.
SHOULD BE FREE-FREE BUT HAS INADVERTANT SPC

SEPTEMBER 15, 2000 MSC/NASTRAN 10/22/98 PAGE 32

EIGENVALUE = -2.511024E-08 - **MODE 2**

F O R C E S O F S I N G L E - P O I N T C O N S T R A I N T							
POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
222	G	.0	5.179324E-11	.0	.0	.0	.0

EIGENVALUE = 4.101958E-08 - **MODE 3**

F O R C E S O F S I N G L E - P O I N T C O N S T R A I N T							
POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
222	G	.0	-4.770692E-11	.0	.0	.0	.0

EIGENVALUE = -1.034537E-07 - **MODE 4**

F O R C E S O F S I N G L E - P O I N T C O N S T R A I N T							
POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
222	G	.0	-2.721290E-11	.0	.0	.0	.0

EIGENVALUE = -1.329127E-07 - **MODE 5**

F O R C E S O F S I N G L E - P O I N T C O N S T R A I N T							
POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
222	G	.0	2.822018E-10	.0	.0	.0	.0

EIGENVALUE = 1.034727E+07 - **MODE 6**

F O R C E S O F S I N G L E - P O I N T C O N S T R A I N T							
POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
222	G	.0	-3.426692E+04	.0	.0	.0	.0

TEST OF MSC V70.5 EQUIL DMAP CULLED FROM CBMSC-V705.DMP
BAR WITH G,N,F,A,SETS.

SHOULD BE FREE-FREE BUT HAS INADVERTANT SPC
EIGENVALUE = 1.000000E-35

SEPTEMBER 15, 2000 MSC/NASTRAN 10/22/98 PAGE 40

ELEMENT	F O R C E S		I N B A R E L E M E N T S		(C B A R)		AXIAL	TORQUE
	BEND-MOMENT	END-A	BEND-MOMENT	END-B	- SHEAR -	FORCE		
ID.	PLANE 1	PLANE 2	PLANE 1	PLANE 2	PLANE 1	PLANE 2		
1	.0	-2.910383E-11	.0	4.365575E-11	.0	-7.275958E-12	.0	.0
2	.0	.0	.0	.0	.0	.0	.0	.0
3	.0	.0	.0	.0	.0	.0	.0	.0
EIGENVALUE	= -2.511024E-08							
ELEMENT	F O R C E S		I N B A R E L E M E N T S		(C B A R)		AXIAL	TORQUE
	BEND-MOMENT	END-A	BEND-MOMENT	END-B	- SHEAR -	FORCE		
ID.	PLANE 1	PLANE 2	PLANE 1	PLANE 2	PLANE 1	PLANE 2		
1	1.818989E-11	1.455192E-11	4.183676E-10	-1.273293E-11	-4.001777E-11	2.728484E-12	-2.328306E-10	.0
2	.0	-5.820766E-10	-4.365575E-10	.0	4.365575E-11	-5.820766E-11	-2.910383E-11	.0
3	4.947651E-10	.0	-1.455192E-11	.0	5.093170E-11	.0	.0	.0
EIGENVALUE	= 4.101958E-08							
ELEMENT	F O R C E S		I N B A R E L E M E N T S		(C B A R)		AXIAL	TORQUE
	BEND-MOMENT	END-A	BEND-MOMENT	END-B	- SHEAR -	FORCE		
ID.	PLANE 1	PLANE 2	PLANE 1	PLANE 2	PLANE 1	PLANE 2		
1	.0	2.910383E-11	2.910383E-10	-4.365575E-11	-2.910383E-11	7.275958E-12	-1.455192E-11	.0
2	.0	-2.328306E-10	4.729372E-10	-1.600711E-10	-4.729372E-11	-7.275958E-12	2.182787E-11	.0
3	-4.729372E-10	.0	4.547474E-12	.0	-4.774847E-11	.0	.0	.0
EIGENVALUE	= -1.034537E-07							
ELEMENT	F O R C E S		I N B A R E L E M E N T S		(C B A R)		AXIAL	TORQUE
	BEND-MOMENT	END-A	BEND-MOMENT	END-B	- SHEAR -	FORCE		
ID.	PLANE 1	PLANE 2	PLANE 1	PLANE 2	PLANE 1	PLANE 2		
1	5.820766E-11	2.910383E-11	4.947651E-10	2.910383E-11	-4.365575E-11	.0	1.746230E-10	.0
2	-5.820766E-11	-5.529728E-10	2.328306E-10	-4.365575E-11	-2.910383E-11	-5.093170E-11	-3.492460E-10	.0
3	-2.328306E-10	-1.455192E-11	5.820766E-11	-1.455192E-11	-2.910383E-11	.0	.0	.0
EIGENVALUE	= -1.329127E-07							
ELEMENT	F O R C E S		I N B A R E L E M E N T S		(C B A R)		AXIAL	TORQUE
	BEND-MOMENT	END-A	BEND-MOMENT	END-B	- SHEAR -	FORCE		
ID.	PLANE 1	PLANE 2	PLANE 1	PLANE 2	PLANE 1	PLANE 2		
1	-5.820766E-11	.0	-1.149601E-09	-1.455192E-10	1.091394E-10	1.455192E-11	2.037268E-10	.0
2	5.820766E-11	1.091394E-09	-2.997695E-09	1.818989E-11	3.055902E-10	1.073204E-10	2.328306E-10	.0
3	2.881279E-09	2.910383E-11	4.365575E-11	2.910383E-11	2.837623E-10	.0	.0	.0
EIGENVALUE	= 1.034727E+07							
ELEMENT	F O R C E S		I N B A R E L E M E N T S		(C B A R)		AXIAL	TORQUE
	BEND-MOMENT	END-A	BEND-MOMENT	END-B	- SHEAR -	FORCE		
ID.	PLANE 1	PLANE 2	PLANE 1	PLANE 2	PLANE 1	PLANE 2		
1	.0	.0	1.047600E+05	.0	-1.047600E+04	.0	-3.523489E+03	.0
2	.0	-1.047600E+05	3.426692E+05	8.971579E-04	-3.426692E+04	-1.047600E+04	-2.267542E+04	.0
3	-3.426692E+05	.0	-3.472156E-03	-7.275958E-11	-3.426692E+04	7.275958E-12	.0	.0